

KLM

**Technology
Group**

**KLM Technology Group
Engineering Solutions**



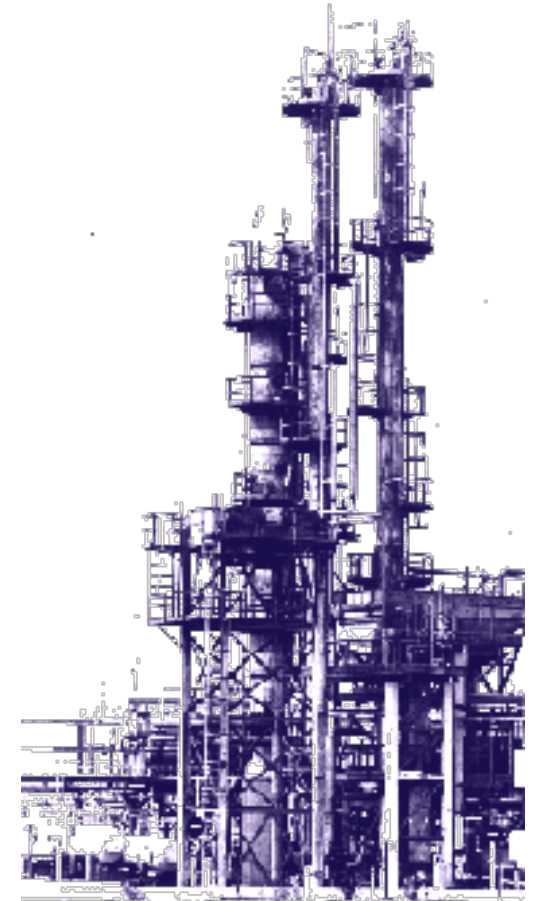
KLM Technology Group

Consulting, Guidelines, and Training

Engineering Solutions

Based in USA since 1995, with offices in Florida and Malaysia

KLM is a technical consultancy group, providing specialized services and equipment to improve process plant operational efficiency, profitability and safety.



KLM Core Business

Training (75+ Training Classes)

Engineering Design Guidelines

Process Optimization Studies

Process Energy Studies

Process Safety Management

HAZOP Facilitation

Facility Siting Studies

Engineering Support

Basic Design Packages

Detailed Design Packages

Process Equipment

Random Packing

Structured Packing

Demister Pads

Heat Exchangers

Marketing

Engineering Practice Magazine

Unit Commissioning

**Distillation Equipment Inspecting
and Correct Installation**

Evaluation of Process Units

KLM Technology Group has been providing Engineering Solutions since 1997 in USA and since 2005 in Asia with our key partners and manufactures.

We have assisted small, medium and multi-national corporations to supply Practical Equipment Solutions all over the world.

USA - Malaysia – Thailand – Kuwait - UAE

India – Poland – China – Belarus- Bahrain

Indonesia – Saudi Arabia – Italy - Nigeria

Philippines – Vietnam – South Korea

New Zealand

Why should you purchase your process equipment from KLM Technology Group?

1. **KLM is a recognized expert in Process Equipment Design.**
2. **As Process Equipment Simulation and Installation experts, we can provide Process Guarantees, including capacity and purity. Most vendors will only provide hydraulic guarantees, not capacity and purity guarantees. A Process Study can provide a large return on investment.**
3. **KLM only partners with high quality suppliers, often from the same factories as the Original Equipment Manufactures (OEM).**
4. **KLM has low overhead leading to cost savings to your team.**
5. **KLM has senior inspectors to ensure your equipment is installed correctly**

KLM Technology Group should be your Equipment Supplier of Choice

- 1. KLM is a recognized expert in Process Equipment Design.**
 - A. The Kolmetz Handbook of Process Equipment Design is highly rated for the design of process equipment. Detailed theory of equipment design with examples.**
 - B. Higher Reliability designs gained from years of experience**
 - C. Higher Efficiently which leads to Better Products at Lower Energy Cost**
 - D. Basic and Detailed Engineering Packages**

KLM Technology Group should be your Equipment Supplier of Choice

KLM is a leading Process Equipment Design Group

General Distillation Design Guideline – 147 pages

Tray Hydraulics Design Guideline – 50 pages

Packing Hydraulic Design Guideline – 68 pages

Heat Exchanger Design Guideline – 176 pages

Reboiler Design Guideline – 70 pages

Demister Pad Design Guideline - 89 pages

Separator Design Guideline – 120 pages

Coalescer Design Guideline – 120 pages

**Over 100 Guidelines on most Process Equipment
and Unit Operations**

3. KLM only partners with high quality suppliers, often from the same factories as the Original Equipment Manufactures (OEM).

- A. KLM vets our equipment manufacturing partners to meet the high-quality KLM Manufacturing Standards.**
- B. Many times, our partners are the same factory as the OEM.**
- C. KLM will meet you at our factory partner for an inspection.**

KLM Technology Group should be your Equipment Supplier of Choice

To further assist our partner clients, we offer new and replacement engineering equipment from the Original Equipment Manufactures or Generic Equipment Manufactures as requested by our partner clients.

We have provided tower internals, tower shells, heat exchangers, overhead condensers, reboilers, control systems, demister pads and pumps.

KLM Technology Group – Equipment References

- 1. Over 20 Distillation Projects**
- 2. Over 40 Heat Exchangers**
- 3. Over 25 Pumps**
- 4. Over 20 Pressure Vessels**

4. KLM has low overhead leading to cost savings to your team.

- A. The advantage for the end user is that KLM's overhead cost is significantly lower than other EPC companies and / or other equipment providers, leading to significantly lower equipment cost with the potential of higher quality, leading to the best of both worlds; high quality at a very competitive cost. Our Overhead Cost is low, and we pass the savings to your team.**
- B. Many companies have multiple offices with 100's of salespeople. This overhead can be as high as 15% of equipment quote.**

KLM Technology Group should be your Equipment Supplier of Choice

4. KLM has low overhead leading to cost savings to your team.

- C. A good engineer or purchasing manager would bid to KLM just to set the proper cost of the process equipment. Often KLM may want a small fee to bid as there are engineering hours in the bidding process – but you could save 15 to 25% on the equipment cost netting Return On Investment of thousands even if you do not purchase from KLM.**
- D. You now know from reading this presentation most bids are at least 15% or more higher than KLM might bid. Many times, the OEM will bid below cost just to keep a small company like KLM from winning the job, good for your company, and great ROI on your bidding to KLM.**

KLM Technology Group should be your Equipment Supplier of Choice

5. KLM has senior inspectors to ensure your equipment is installed correctly

- A. A large problem in many tower internal installations is incorrect installation, leading to loss of product quality, tower efficiency (higher energy), capacity and run length (plant reliability).**
- B. Many companies may not have the expertise to review the tower internal installation, because turnarounds only have every few years.**

KLM Technology Group should be your Equipment Supplier of Choice

5. KLM has senior inspectors to ensure your equipment is installed correctly

- C. KLM will provide a senior tower inspector with 75+ tower inspections, for your turnaround to assist in optimized tower performance.**
- D. KLM's Low Overhead cost will again lead to large cost saving in tower inspections.**

KLM Technology Group should be your Equipment Supplier of Choice

Process Equipment

KLM as an EPC Company can purchase from any of the major equipment Suppliers.

Distillation Equipment

Towers Shells and Vessels

Random Packing

Structured Packing

Trays

Demister Pads and Coalescer Elements

Heat Exchange Equipment

Pumps and Compressors

Coalescer Systems

KLM Core Business

Process Equipment

Distillation Equipment

Can be ordered with normal lead times or can be sources for immediate replacement

Random Packing

KLM has a stock of random packing in key Countries for Immediate replacement

Structured Packing

KLM has a stock of Structured Packing in key countries for immediate replacement

KLM Core Business

Process Equipment

Distillation Equipment

Tray Hardware

KLM has a stock of Tray Hardware in key countries for immediate replacement

Trays

KLM has the resources to order with normal lead time or source for immediate replacement

KLM Core Business

Process Equipment

Distillation Equipment

Demister Pads and Coalescer Elements

KLM has the resources to order with normal lead time or source for immediate replacement



KLM Core Business

Selected Key Projects

Revamp BTX Stripper Column Basis Refinery USA (1995)

Revamp BTX Plant for Titan Ethylene Plant Malaysia (2001)

Basic Design Package for Petronas Idemitsu in Malaysia (2006)
Designed a Distillation System

Basic Design Package for BST in Thailand (2007) Designed a Distillation System

Ethylene Plant Environmental Study for Titan in Malaysia (2007)

Ethylene Plant Revamp Study for Titan in Malaysia (2007)

Commissioned 5 BTX Units (2008)

Energy Study of Ethylene Plant in Indonesia (2008)

LP Study of Ethylene Plant in Indonesia (2010)

KLM Core Business

Key Projects

Commissioned two Natural Gas Plants in North Dakota (2012)

Process Study for Gas Plant in USA (2013)

Feed Studies for Total Refinery in Port Arthur USA (2013)

White Spirit Clay Treater Skid Package for Middle East (2015)

Process Review for Ethylene Plant Restart in USA (2016)

HAZOP Review for Ethylene Plant Restart in USA (2016)

Process Study for Diesel Hydrotreater (2017)

KLM Core Business

Key Projects

Process Review for Ethylene Unit (2018)

Process Study for Diesel Hydrotreater (2018)

Process Safety Management Consulting for Midstream Company (2018)

Process Safety Management Consulting for Large Chemical Company (2019)

Process Study and supply of Distillation System for Middle East (2020)

Biofuel Project Process Review (2021)

Three Facility Siting Studies (2021)

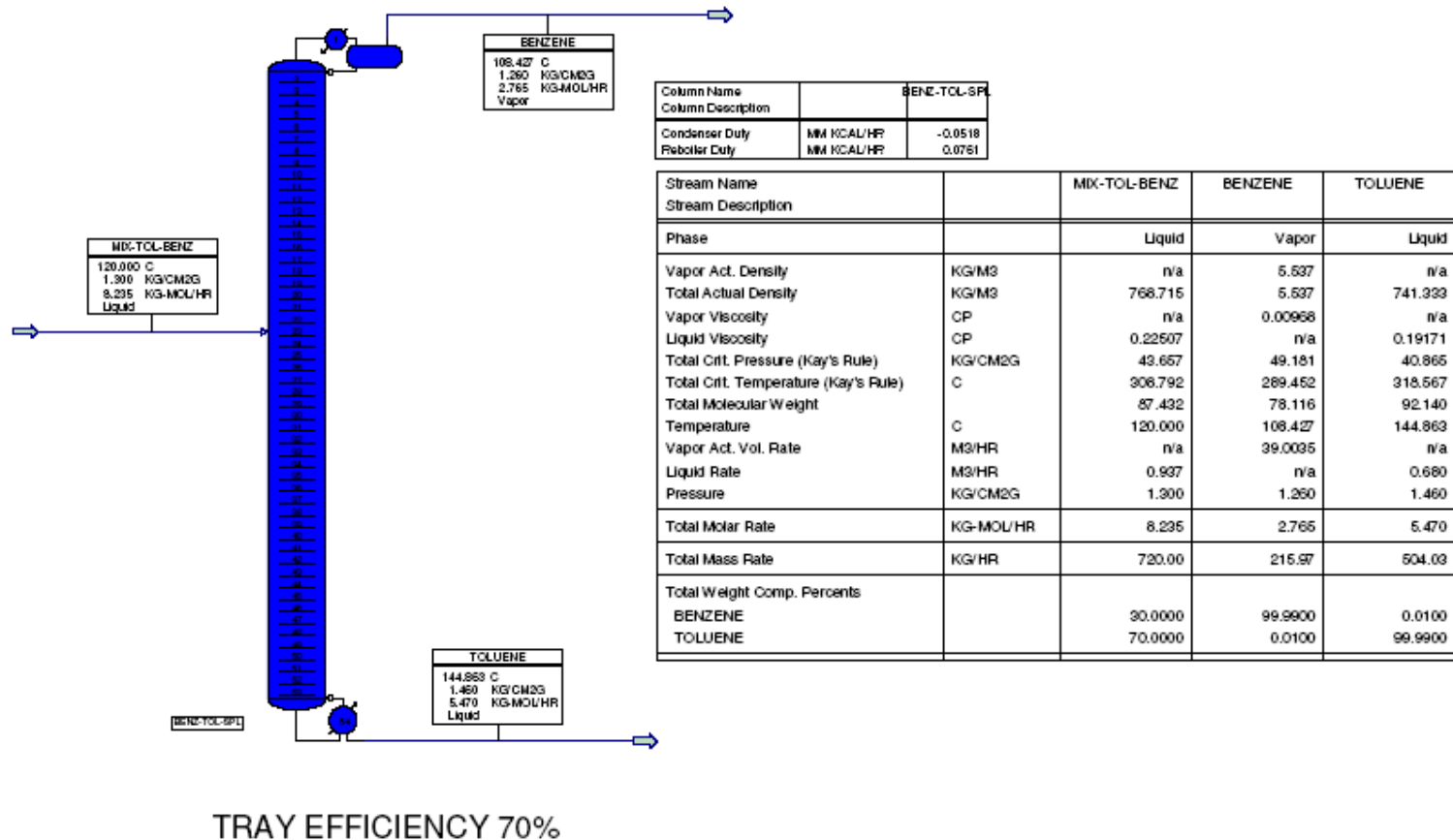
HAZOP Study for Large Chemical Plant USA (2022)

Palm Oil Consulting Malaysia (2023)

In 2006, designed a Benzene Toluene Splitter Column for Idemitsu Petronas in Malaysia.

- **Total Schedule “A” Basic Design Package with process guarantees.**
- **Reviewed and approved by Idemitsu Japan and Sulzer Chemtech.**
- **Constructed by Toyo Engineering.**
- **Unit passed Acceptance Test**

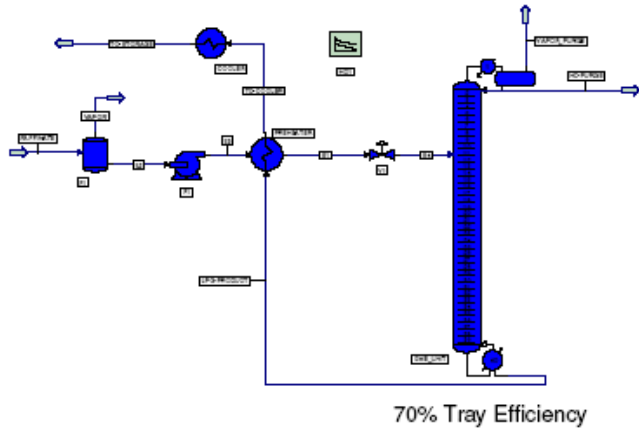
Idemitsu Petrochemical Benzene-Toluene Splitter- Design 120%



In 2007 - BST (Thailand) Distillation Tower

- A. Designed a Basic Design Package and Commissioned a DME Removal Column for BST.**
- B. 100% Designed Column by KLM, with process guarantees.**
- C. Facilitated HAZOP of Process Unit**
- D. Tower, Trays, Pumps, Reboilers, Condensers and Vessels**
- E. Commissioned Unit**
- F. Unit passed Acceptance Test**

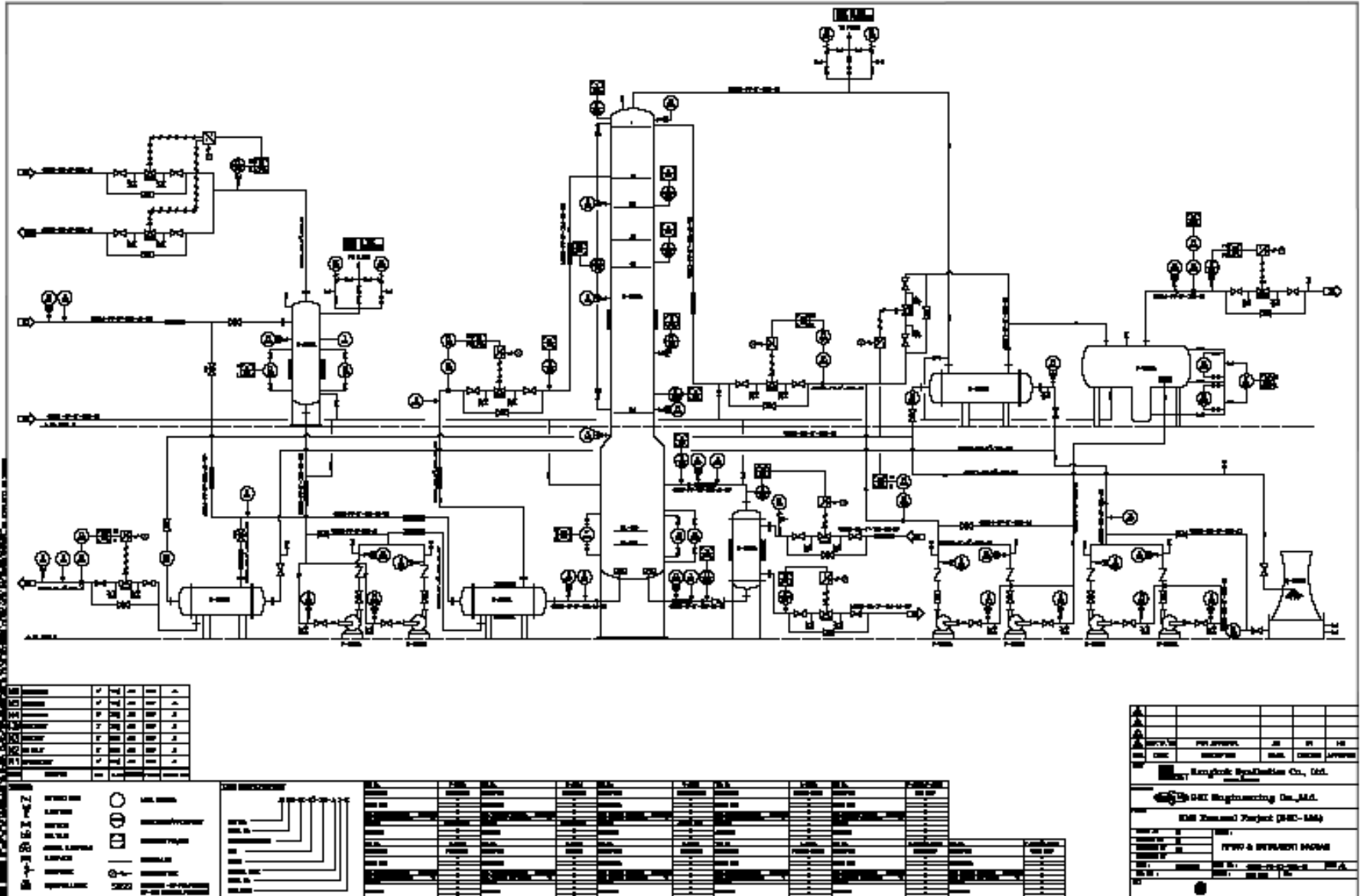
KLM Case Design : (Tower Max Pressure 9.8 barg)
DME-Raffinate - Design Case -CASE1 (Reflux Rate: 6526.0 kg/hr)

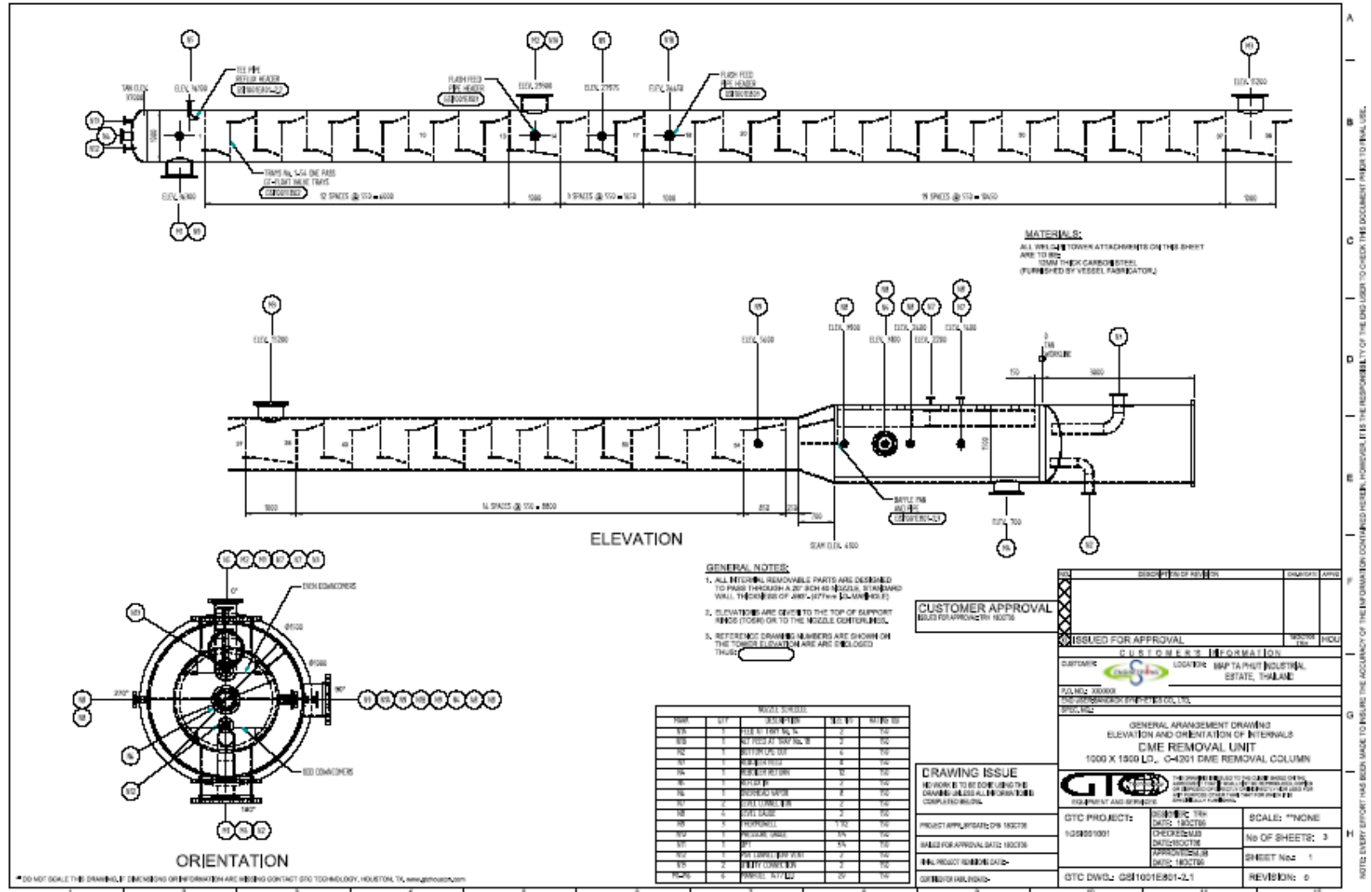


Hi Name		PREHEATER	COOLER
Hi Description			
Duty	MMHICAL/HR	0.0590	0.0302

Column Name		DME_UNIT
Column Description		
Condenser Duty	MMHICAL/HR	-0.5003
Reboiler Duty	MMHICAL/HR	0.0212

Stream Name		RAFFINATE	S4	LPG-PRODUCT	HC-PURGE	VAPOR_PURGE	TC-COOLER
Stream Description		Liquid	Liquid	Liquid	Liquid	Vapor	Liquid
Phase							
Temperature	C	30.000	56.039	74.517	20.644	20.644	50.000
Pressure	KG/CM2G	6.000	9.500	9.800	9.000	9.000	9.400
Total Molecular Weight		57.375	57.375	57.755	45.508	44.890	57.755
Total Mass Rate	KG/HR	3850.000	3850.000	3761.150	0.000	88.850	3761.138
Total Weight Comp. Frao							
H2O		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PROPANE		0.0111393	0.0111393	0.000000	0.3595541	0.4826790	0.000000
MACETHYL		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
PROPDIEN		0.0018257	0.0018257	0.000004	0.0639155	0.0700047	0.000004
BUTANE		0.5102460	0.5102460	0.5306756	0.0716382	0.0354172	0.5306741
BUTANE		0.2819061	0.2819061	0.2886575	0.0000087	0.0000103	0.2886584
ISOBUTENE		0.0712872	0.0712872	0.0729707	0.0000731	0.0000220	0.0729710
ISOBUTENE		0.0528081	0.0528081	0.0540554	0.0000087	0.0000087	0.0540556
IBT		0.0063028	0.0063028	0.0065431	0.0000827	0.0000321	0.0065431
C2BUTENE		0.0456660	0.0456660	0.0467447	0.0000026	0.0000057	0.0467448
PENTANE		0.0002086	0.0002086	0.000135	0.0000000	0.0000000	0.0002135
PENTANE		0.0000012	0.0000012	0.0000013	0.0000000	0.0000000	0.0000013
12BD		0.0000003	0.0000003	0.0000003	0.0000000	0.0000000	0.0000003
13BD		0.0000008	0.0000008	0.0000008	0.0000000	0.0000000	0.0000008
3M BUTEH		0.0000110	0.0000110	0.0000112	0.0000000	0.0000000	0.0000113
ISOBUTENE		0.0000002	0.0000002	0.0000002	0.0000000	0.0000000	0.0000002
VACETHYL		0.0000011	0.0000011	0.0000011	0.0000000	0.0000000	0.0000011
HEXANE		0.0001204	0.0001204	0.0001233	0.0000000	0.0000000	0.0001233
METHANOL		0.0000001	0.0000001	0.0000001	0.0000000	0.0000000	0.0000001
MTBE		0.0000001	0.0000001	0.0000001	0.0000000	0.0000000	0.0000001
DME		0.0002950	0.0002950	0.0000008	0.5137493	0.4027303	0.0000008



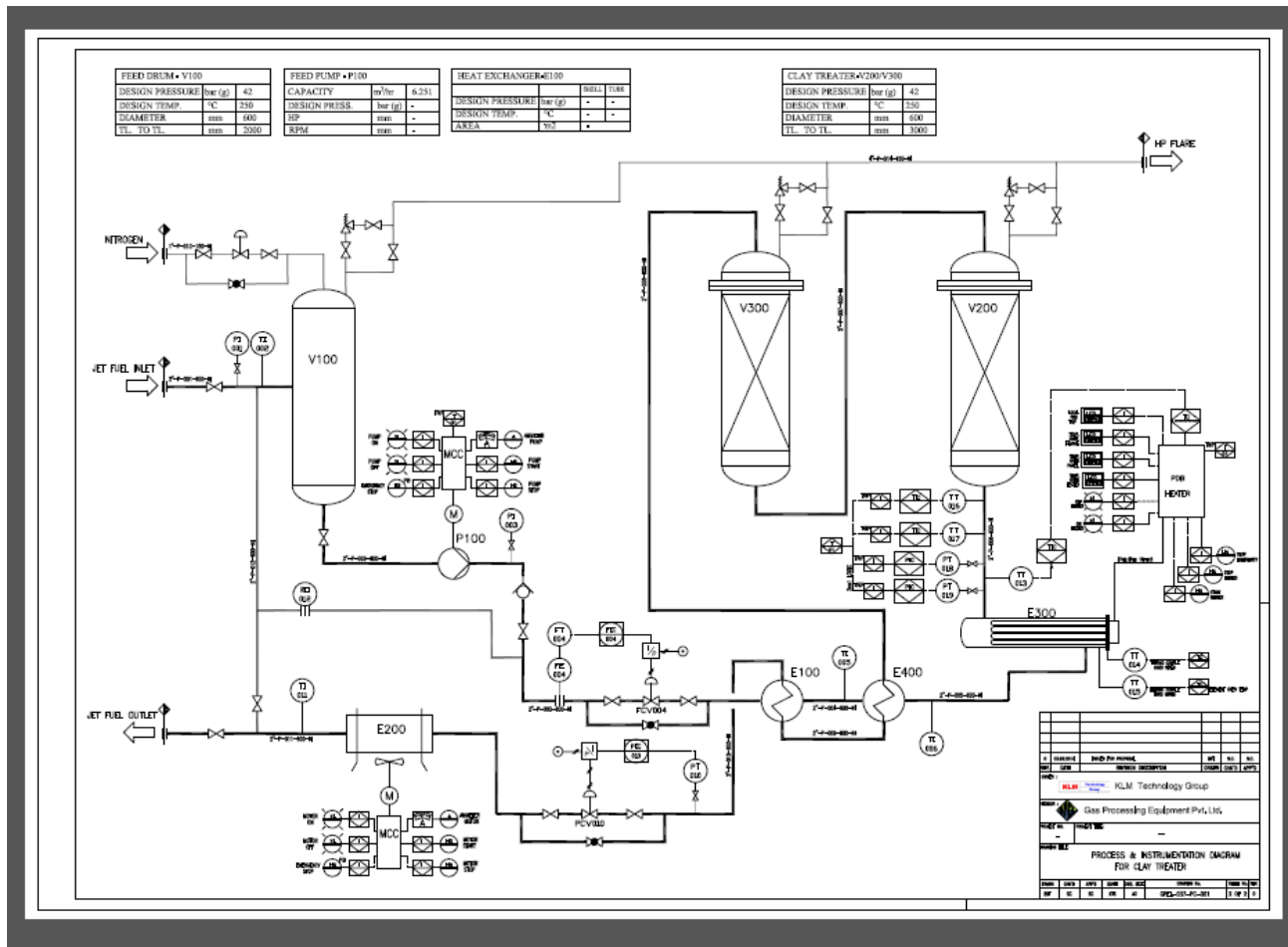




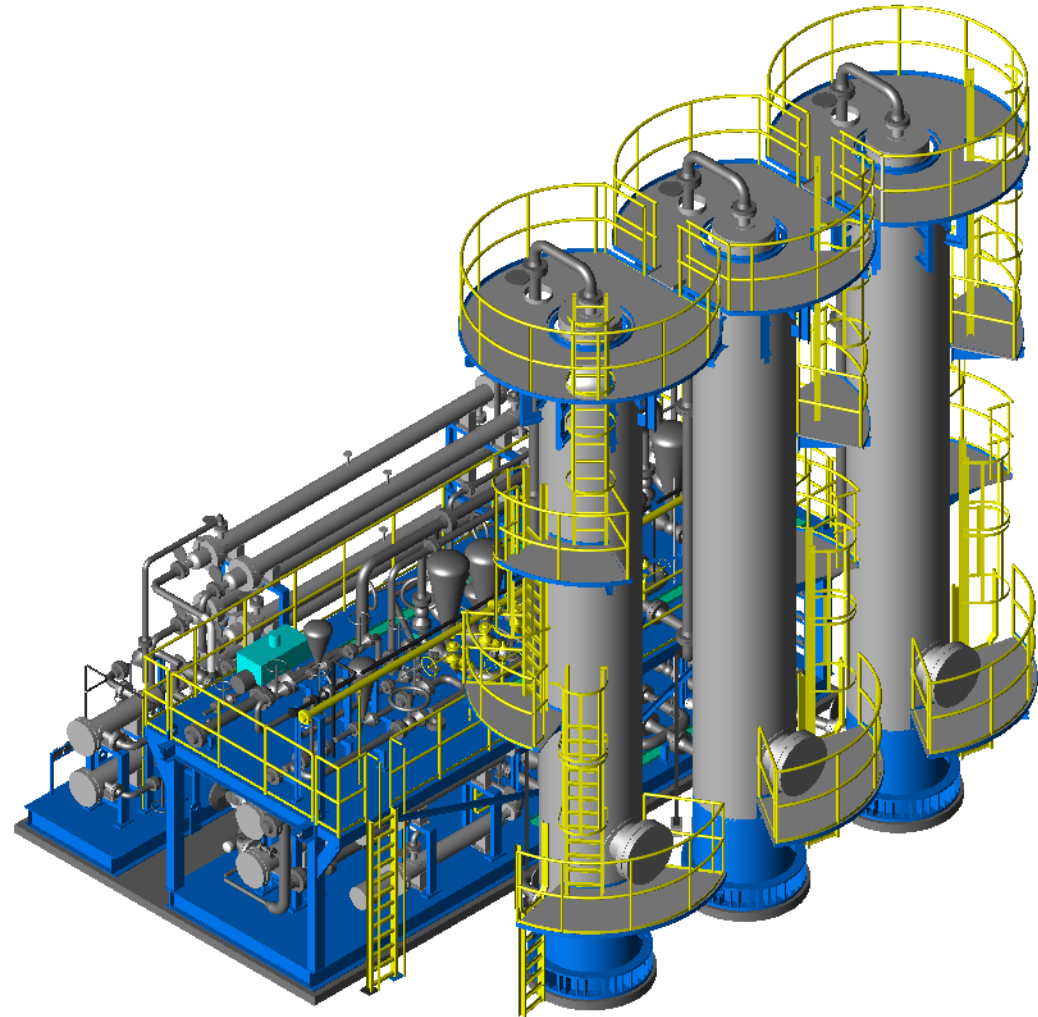
Clay Treater for Solvent White Spirits

- A. Designed Basic and Detailed Package for Clay Treater Reactor to improve color and odor.**
- B. 100% Designed by KLM, with process guarantees.**
- C. Reactor, Pumps, Heat Exchangers and Vessels**
- D. Commissioned Unit**
- E. Unit Passed Acceptance Test**

Clay Treater



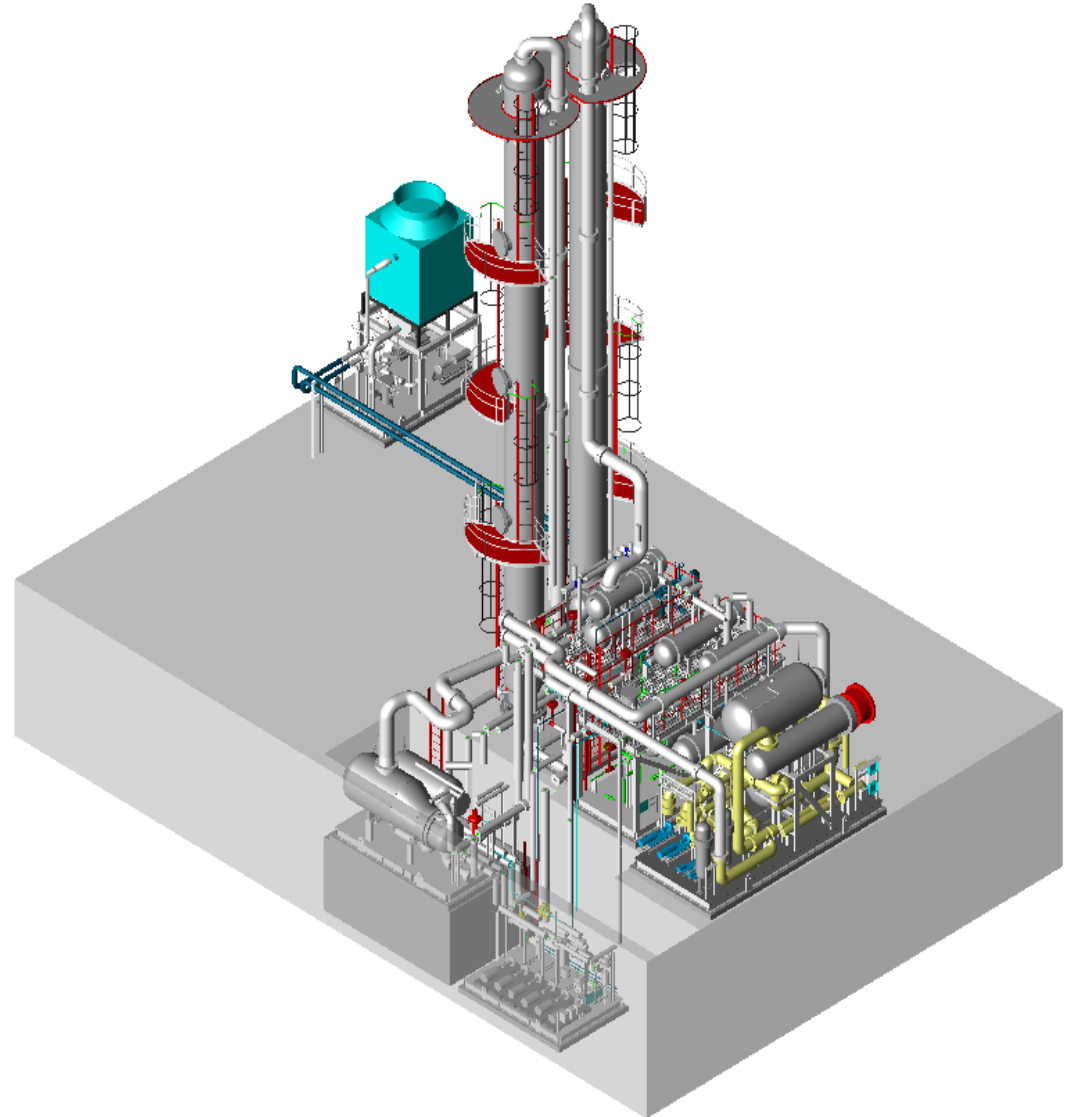
Clay Treater



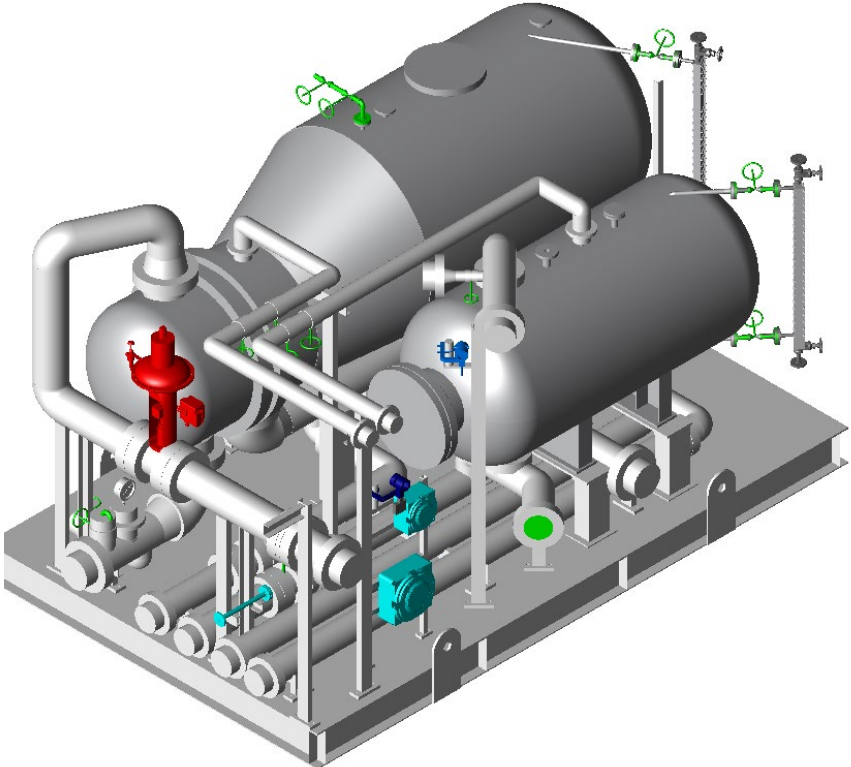
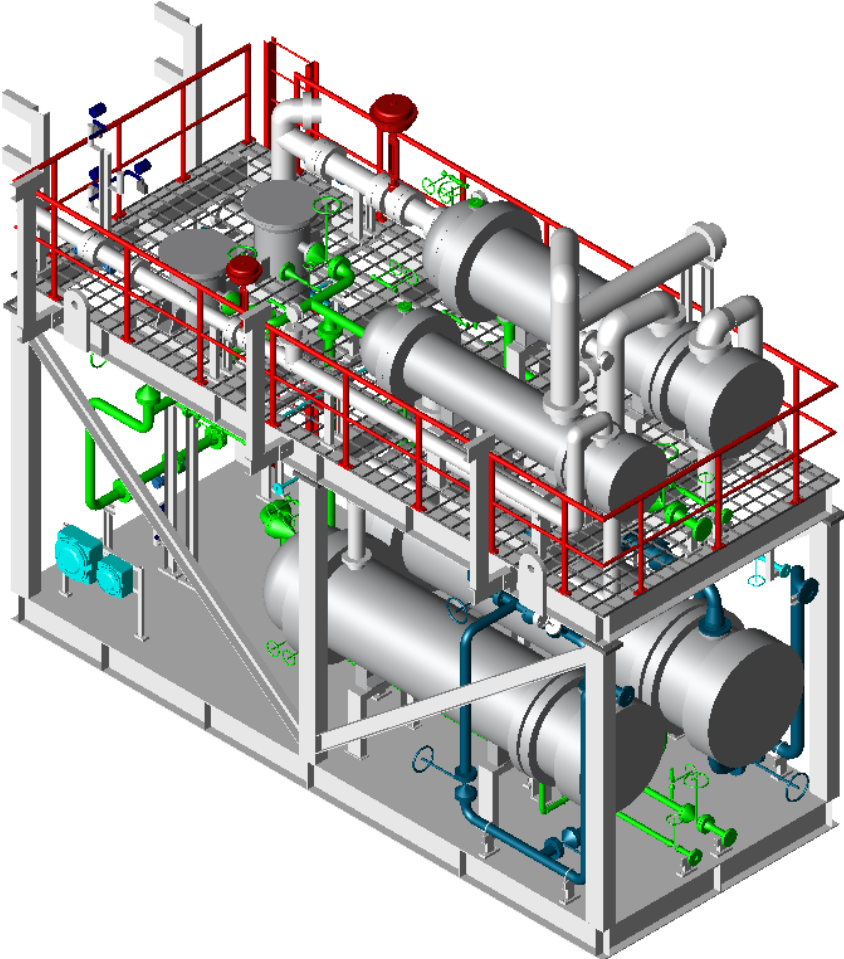
Clay Treater



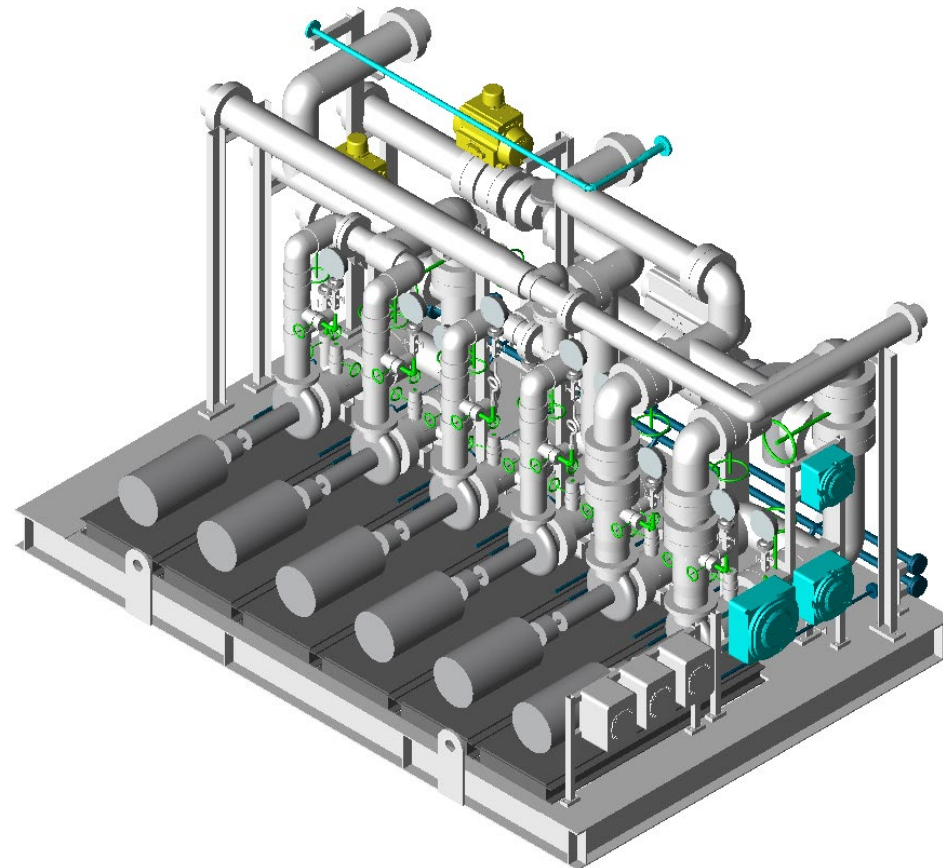
Distillation System



Distillation System

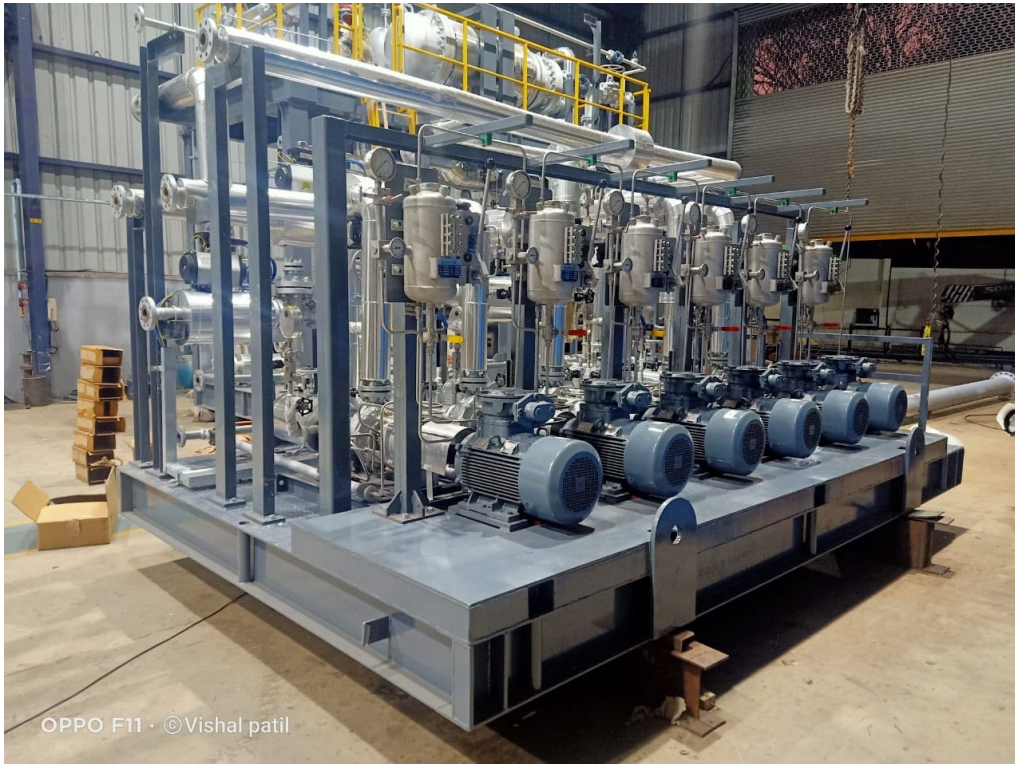


Distillation System



Projects

Distillation System



Projects

Distillation System



KLM Technology Group – Equipment References

- 1. Over 20 Distillation Projects**
- 2. Over 40 Heat Exchangers**
- 3. Over 25 Pumps**
- 4. Over 20 Pressure Vessels**

KLM Technology Group

- 1. Solid Track Record of Projects since 1995.**
- 2. Strength in Process Engineering**
- 3. Strong Partners in Mechanical Engineering and Fabrication, especially Modular Fabrication.**
- 4. Wide Range of Industries Serviced.**
- 5. Ready to assist in your next project.**

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Process Safety Management

HAZOP Facilitation

Facility Siting Studies

Engineering Support

Basic Design Packages

Detailed Design Packages

Process Equipment

Random Packing

Structured Packing

Marketing

Unit Commissioning

**Distillation Inspection and
Correct Instillation**

Unit Benchmarking

Evaluation of Process Units



Thank You

